

Search Plan and Results

Question

What is the effect of dietary cholesterol intake on risk of cardiovascular disease, including effects on intermediate markers such as serum lipid and lipoprotein levels and inflammation? (DGAC 2010)

Date Searched

07/20/2009

Inclusion Criteria

Subjects/Population

- *Age:* Two years through adult
- *Setting:* US and International
- *Health status:* Healthy and those with elevated chronic disease risk (CHD/CVD, type 2 diabetes, metabolic syndrome and obesity).

Search Criteria

- *Study design preferences:* RCT or clinical controlled studies, large non-randomized observational studies, meta-analysis and systematic reviews. Feeding period must be greater than four weeks
- *Size of study groups:* The sample size must be 10 or more subjects for each study group. For example, this would include 10 patients in the intervention group and 10 patients in the control or comparison group
- *Study dropout rate:* Less than 20%; preference for smaller dropout rates
- *Year range:* 1999 to present
- *Languages:* Limited to articles in English
- *Other:* Article must be published in peer-reviewed journal.

Exclusion Criteria

Subjects/Population

- *Age:* Infants/children less than two years
- *Setting:* Inpatients.

Search Criteria

- *Size of study groups:* Sample sizes less than 10
- *Study designs:* Cross-sectional; feeding periods less than four weeks
- *Study dropout rate:* If the dropout rate in a study is 20% or greater
- *Year range:* Prior to January 2000
- *Authorship:* Studies by same author with similar in content
- *Languages:* Articles not in English
- *Other:* Animal studies; abstracts or presentations.

Search Terms: Search Vocabulary

"Cholesterol, Dietary" [MeSH Major Topic]

"Cholesterol, Dietary" [MeSH] AND "Lipoproteins, LDL" [MeSH] AND "Cholesterol, LDL" [MeSH]

"Cholesterol, Dietary" [MeSH] AND "Cardiovascular Disease" [MeSH]

"Cholesterol, Dietary" [MeSH] AND "Inflammation" [MeSH]

Eggs Cardiovascular Disease (Key Words)

Eggs LDL Cholesterol (Key Words)

Eggs Inflammation (Key Words)

Electronic Databases

Total hits from all electronic database searches: 61

Total articles identified to review from electronic databases: 30

Articles Identified Via Handsearch or Other Means

Hand Search: One primary article (Qureshi et al., 2007).

Summary of Articles Identified to Review

Number of Primary Articles Identified: 13

Number of Review Articles Identified: 3

Total Number of Articles Identified: 16

Number of Articles Reviewed but Excluded: 14

List of Articles Included for Evidence Analysis

Systematic Review/Meta-Analyses

Kritchevsky SB, Kritchevsky D. [Egg consumption and coronary heart disease: An epidemiologic overview](#). *J Am Coll Nutr*. 2000 Oct; 19(5 Suppl): 549S-555S. Review. PMID: 11023006.

McNamara DJ. [The impact of egg limitations on coronary heart disease risk: Do the numbers add up?](#) *J Am Coll Nutr*. 2000 Oct; 19(5 Suppl): 540S-548S. Review. PMID: 11023005.

Weggemans RM, Zock PL, Katan MB. [Dietary cholesterol from eggs increases the ratio of total cholesterol to high-density lipoprotein cholesterol in humans: A meta-analysis](#). *Am J Clin Nutr*. 2001 May; 73(5): 885-891. PMID: 11333841.

Primary Articles

Ballesteros MN, Cabrera RM, Saucedo Mdel S, Fernandez ML. [Dietary cholesterol does not increase biomarkers for chronic disease in a pediatric population from northern Mexico](#). *Am J Clin Nutr*. 2004 Oct; 80(4): 855-861. PMID: 15447890.

Djoussé L, Gaziano JM. [Egg consumption in relation to cardiovascular disease and mortality: The Physicians' Health Study](#). *Am J Clin Nutr*. 2008 Apr; 87(4): 964-969. PMID: 18400720.

Harman NL, Leeds AR, Griffin BA. [Increased dietary cholesterol does not increase plasma low density lipoprotein when accompanied by an energy-restricted diet and weight loss](#). *Eur J Nutr*. 2008 Sep; 47(6): 287-293. Epub 2008 Aug 26. Erratum in: *Eur J Nutr*. 2008 Oct; 47(7): 408. PMID: 18726564.

Goodrow EF, Wilson TA, Houde SC, Vishwanathan R, Scollin PA, Handelman G, Nicolosi RJ. [Consumption of one egg per day increases serum lutein and zeaxanthin concentrations in older adults without altering serum lipid and lipoprotein cholesterol concentrations](#). *J Nutr*. 2006 Oct; 136(10): 2, 519-2, 524. PMID: 16988120.

Greene CM, Zern TL, Wood RJ, Shrestha S, Aggarwal D, Sharman MJ, Volek JS, Fernandez ML. [Maintenance of the LDL cholesterol:HDL cholesterol ratio in an elderly population given a dietary cholesterol challenge](#). *J Nutr*. 2005 Dec; 135(12): 2, 793-2, 788. PMID: 16317122.

Hu FB, Stampfer MJ, Rimm EB, Manson JE, Ascherio A, Colditz GA, Rosner BA, Spiegelman D, Speizer FE, Sacks FM, Hennekens CH, Willett WC. [A prospective study of egg consumption and risk of cardiovascular disease in men and women](#). *JAMA*. 1999 Apr 21;281(15):1, 387-1, 394. PMID: 10217054.

Knopp RH, Retzlaff B, Fish B, Walden C, Wallick S, Anderson M, Aikawa K, Kahn SE. [Effects of insulin resistance and obesity on lipoproteins and sensitivity to egg feeding](#). *Arterioscler Thromb Vasc Biol*. 2003 Aug 1; 23(8): 1, 437-1, 443. Epub 2003 Jun 19. PMID: 12816878.

Mutungi G, Ratliff J, Puglisi M, Torres-Gonzalez M, Vaishnav U, Leite JO, Quann E, Volek JS, Fernandez ML. [Dietary cholesterol from eggs increases plasma HDL cholesterol in overweight men consuming a carbohydrate-restricted diet](#). *J Nutr*. 2008 Feb; 138(2): 272-276. PMID: 18203890.

[A prospective study of egg consumption and risk of cardiovascular disease in men and women](#). *JAMA*. 1999 Apr 21; 281(15): 1, 387-1, 394. PMID: 10217054.

Nakamura Y, Iso H, Kita Y, Ueshima H, Okada K, Konishi M, Inoue M, Tsugane S. [Egg consumption, serum total cholesterol concentrations and coronary heart disease incidence: Japan Public Health Center-based prospective study](#). *Br J Nutr.* 2006 Nov; 96(5): 921-928. PMID: 17092383.

Qureshi AI, Suri FK, Ahmed S, Nasar A, Divani AA, Kirmani JF. [Regular egg consumption does not increase the risk of stroke and cardiovascular diseases](#). *Med Sci Monit.* 2007 Jan; 13(1): CR1-8. Epub 2006 Dec 18. PMID: 17179903.

Reaven GM, Abbasi F, Bernhart S, Coulston A, Darnell B, Dashti N, Kim H, Kulkarni K, Lamendola C, McLaughlin T, Osterlund L, Schaff P, Segrest J. [Insulin resistance, dietary cholesterol, and cholesterol concentration in postmenopausal women](#). *Metabolism.* 2001 May; 50(5): 594-597. PMID: 11319723.

Tanasescu M, Cho E, Manson JE, Hu FB. [Dietary fat and cholesterol and the risk of cardiovascular disease among women with type 2 diabetes](#). *Am J Clin Nutr.* 2004 Jun; 79(6): 999-1, 005. PMID: 15159229.

Tannock LR, O'Brien KD, Knopp RH, Retzlaff B, Fish B, Wener MH, Kahn SE, Chait A. [Cholesterol feeding increases C-reactive protein and serum amyloid A levels in lean insulin-sensitive subjects](#). *Circulation.* 2005 Jun 14; 111(23): 3, 058-3, 062. Epub 2005 Jun 6. PMID: 15939816.

List of Excluded Articles with Reason

Article	Reason for Exclusion
Burnett JR, Huff MW. Cholesterol absorption inhibitors as a therapeutic option for hypercholesterolaemia . <i>Expert Opin Investig Drugs.</i> 2006 Nov; 15(11): 1, 337-1, 351. Review. PMID: 17040195.	Does not address question: Examines cholesterol absorption inhibitors as therapeutic intervention.
Carr TP, Jesch ED. Food components that reduce cholesterol absorption . <i>Adv Food Nutr Res.</i> 2006; 51: 165-204. Review. PMID: 17011476.	Food Science review.
Coico R, Woodruff-Pak DS. Immunotherapy for Alzheimer's disease: harnessing our knowledge of T cell biology using a cholesterol-fed rabbit model . <i>J Alzheimers Dis.</i> 2008 Dec; 15(4): 657-671. Review. PMID: 19096163.	Alzheimer's disease is not a health outcome that is included in this question.
Devaraj S, Jialal I. The role of dietary supplementation with plant sterols and stanols in the prevention of cardiovascular disease . <i>Nutr Rev.</i> 2006 Jul; 64(7 Pt 1): 348-354. Review. PMID: 16910223.	Covers plant sterols and stanols as dietary supplements to inhibit cholesterol absorption.

<p>Herron KL, McGrane MM, Waters D, Lofgren IE, Clark RM, Ordovas JM, Fernandez ML. The ABCG5 polymorphism contributes to individual responses to dietary cholesterol and carotenoids in eggs. <i>J Nutr.</i> 2006 May; 136(5): 1, 161-1, 165. PMID: 16614398.</p>	<p>This article better addresses question 3.1 on genetic polymorphisms.</p>
<p>Hovenkamp E, Demonty I, Plat J, Lütjohann D, Mensink RP, Trautwein EA. Biological effects of oxidized phytosterols: a review of the current knowledge. <i>Prog Lipid Res.</i> 2008 Jan; 47(1): 37-49. Epub 2007 Nov 1. Review. PMID: 18022398.</p>	<p>Narrative review of the cardioprotective effects of oxidized phytosterols.</p>
<p>Ikeda I. Multifunctional effects of green tea catechins on prevention of the metabolic syndrome. <i>AsiaPac J Clin Nutr.</i> 2008; 17 Suppl 1: 273-274. Review. PMID: 18296354.</p>	<p>Narrative review of beneficial effects of green tea catechins to prevent symptoms of metabolic syndrome.</p>
<p>Kassis AN, Vanstone CA, Abu M, Weis SS, Jones PJ. Efficacy of plant sterols is not influenced by dietary cholesterol intake in hypercholesterolemic individuals. <i>Metabolism.</i> 2008 Mar; 57(3): 339-346. PMID: 18249205.</p>	<p>Article is focused on the use of plant sterols, not dietary cholesterol.</p>
<p>Khoury J, Haugen G, Tonstad S, Frøslie KF, Henriksen T. Effect of a cholesterol-lowering diet during pregnancy on maternal and fetal Doppler velocimetry: The CARRDIP study. <i>Am J Obstet Gynecol.</i> 2007 Jun; 196(6): 549.e1-7. PMID: 17547890.</p>	<p>Subjects are pregnant women.</p>
<p>Lucenteforte E, Talamini R, Montella M, Dal Maso L, Tavani A, Deandrea S, Pelucchi C, Greggi S, Zucchetto A, Barbone F, Parpinel M, Franceschi S, La Vecchia C, Negri E. Macronutrients, fatty acids and cholesterol intake and endometrial cancer. <i>Ann Oncol.</i> 2008 Jan; 19(1): 168-172. Epub 2007 Sep 24. PMID: 17895258.</p>	<p>This article is excluded based on the new formulation of the question that does not address cancer as a health outcome.</p>
<p>Paxman JR, Richardson JC, Dettmar PW, Corfe BM. Alginate reduces the increased uptake of cholesterol and glucose in overweight male subjects: a pilot study. <i>Nutr Res.</i> 2008 Aug; 28(8): 501-505. PMID: 19083452.</p>	<p>Treatment, not dietary, study.</p>
<p>Ratliff J, Mutungi G, Puglisi MJ, Volek JS, Fernandez ML. Carbohydrate restriction (with or without additional dietary cholesterol provided by eggs) reduces insulin resistance and plasma leptin without modifying appetite hormones in adult men. <i>Nutr Res.</i> 2009 Apr; 29(4): 262-268. PMID: 19410978.</p>	<p>All subjects in this study were on a carbohydrate restricted diet, both EGG and control groups.</p>

<p>Riechman SE, Andrews RD, Maclean DA, Sheather S. <u>Statins and dietary and serum cholesterol are associated with increased lean mass following resistance training.</u> <i>J Gerontol A Biol Sci Med Sci</i>. 2007 Oct; 62(10): 1, 164-1, 171. PMID: 17921432.</p>	<p>Confounder: Resistance training.</p>
<p>Sutherland WH, de Jong SA, Walker RJ. <u>Effect of dietary cholesterol and fat on cell cholesterol transfer to postprandial plasma in hyperlipidemic men.</u> <i>Lipids</i>. 2007 Oct; 42(10): 901-911. Epub 2007 Aug 7. PMID: 17680290.</p>	<p>Although potentially relevant, subject N<10 per treatment group.</p>